Subsequently, as shown in Fig. 5D, the elements 1' are stuck to a bumper plate 4 with an adhesive 5 applied to a top surface of the bumper plate 4 similarly to the embodiment 1. Then, the thinned semiconductor elements 1' is stuck to a surface coated with the adhesive 5. The adhesive 5 is made of the same material as that described in the embodiment 1.

After the semiconductor elements is stuck, a holding sheet 6 for another dicing process is applied to an undersurface of the bumper plate 4, as shown in Fig. 6A, and the bumper plate 4 is thus held by the sheet 6 to be thereafter diced. In this process, as shown in Fig. 6B, after the sheet 3 is removed from the bump-formed surfaces of the elements 1', the bumper plate 4 is cut a recess of a dicing width b2 for dividing the plate 4 into discrete bumper members 4'. The width b2 is smaller than a dicing width b1 of which recess is formed among the semiconductor elements 1'. Then, the bumper members 4', upon being bonded to respective elements 1' with the adhesive 5, are each removed from the sheet 6. And consequently, similarly to Fig. 6C, discrete semiconductor devices 7, the same devices as the embodiment1, are obtained. The semiconductor devices 7 is then subjected to a taping process in the same manner as the embodiment 1.

(Exemplary Embodiment 3)

Fig. 7A through Fig. 7C and Fig. 8A through Fig. 8D illustrate processes in a method of manufacturing a semiconductor device in accordance with an exemplary embodiment 3 of the present invention. Fig. 9A and Fig. 9B illustrate processes of mounting the semiconductor device in accordance with the present embodiment. Fig. 7A through Fig. 7C and Fig. 8A through Fig. 8D illustrate the method of manufacturing the semiconductor device in order of procedure of the method.

In Fig. 7A, bumps 2, electrodes for external connections, are formed on a top surface of a semiconductor wafer 1 similarly to the embodiment 1 and embodiment 2. Subsequently, as shown in Fig. 7B, a sheet 3 is attached to a electrode-formed surface, which is the top surface of the wafer 1. And the wafer then has an undersurface thinned with being reinforced with the sheet 3. Thus, the wafer 1 is thinned to a thickness of about 50μm.

A holding sheet 6 for a dicing process is then attached to the undersurface of the semiconductor wafer 1, while the reinforcing sheet 3 used for the thinning is removed. Then, the wafer 1 held by the sheet 6 is subjected to the dicing process. In this process, diced grooves 1a are formed as shown in Fig. 7C, and the wafer 1 is then cut along the grooves and divided into semiconductor elements 1'. The elements 1' are removed from the sheet 6, and provided as shown in Fig. 8A.

Subsequently, the semiconductor element 1' is stuck to a bumper case 14. The bumper case 14, which is a reinforcing member used in the present embodiment, includes a projection 14a provided at a border of the case and a recess portion 14b formed at a portion to which the element 1' is bonded, as shown in Fig. 8B. An adhesive 5 made of the same material as that of the embodiment 1 is applied to the portion corresponding to the element 1' within the recess portion 14b. As shown in Fig. 8C, the element 1' is mounted at the recess portion 14b and bonded to the bumper case 14 with the adhesive 5. Consequently, a semiconductor device 15 is provided. The bumper case 14, upon being bonded to the element 1', has an edge of the projection 14a not project from tips of the bumps 2 of the element 1'.

The bumper case 14 functions as a holding member during handling the semiconductor device 15 and also functions as the reinforcing member to protect the semiconductor element 1' from external force and impact similarly

to the embodiment 1 and embodiment 2. The bumper case 14 protects sides of the element 1' according to the present embodiment, thus improving reliability of the semiconductor device 15. The semiconductor device 15 is then inverted as shown in Fig. 8D and subjected to a taping process. Thus, the device 15 can be mounted with by an electronic component mounting apparatus.

Mounting the semiconductor device 15 will be described hereinafter with referring to Fig. 9A and Fig. 9B. As shown in Fig. 9A, the device 15, upon having a top surface of bumper case 14 sucked and held by a mounting head 10, is positioned above the substrate 11 by the head 10. In the present embodiment, an adhesive 16 is previously applied to a region (which corresponds to the projection 14a of the bumper case 14) surrounding electrodes 12 on a top surface of the substrate 11. The semiconductor device 15 has the bumps 2 aligned with respective electrodes 12 of the substrate 11, and then, the head 10 is lowered to have the bumps 2 of the semiconductor element 1' mounted on the electrodes 12.

Thus, the projection 14a of the bumper case 14 contacts with the adhesive 16 on the substrate 11. Subsequently, with being heated, the substrate 11 has the electrodes 12 bonded to the bumps 2 by soldering as shown in Fig. 9B. And then, the bumper case 14 is secured to the substrate 11 by the adhesive 16. As described above, even in this embodiment, the mounting head 10 holds the bumper case 14, which is a holding member, during handling of the semiconductor device 15.

In an assembly including the semiconductor device 15 mounted on the substrate 11, the device 15 is fixed to the substrate 11 through the bonding point of the bumps 2 of the device 15 and the respective electrodes 12 of the substrate 11 as a workpiece, and through the bonding point of the border of